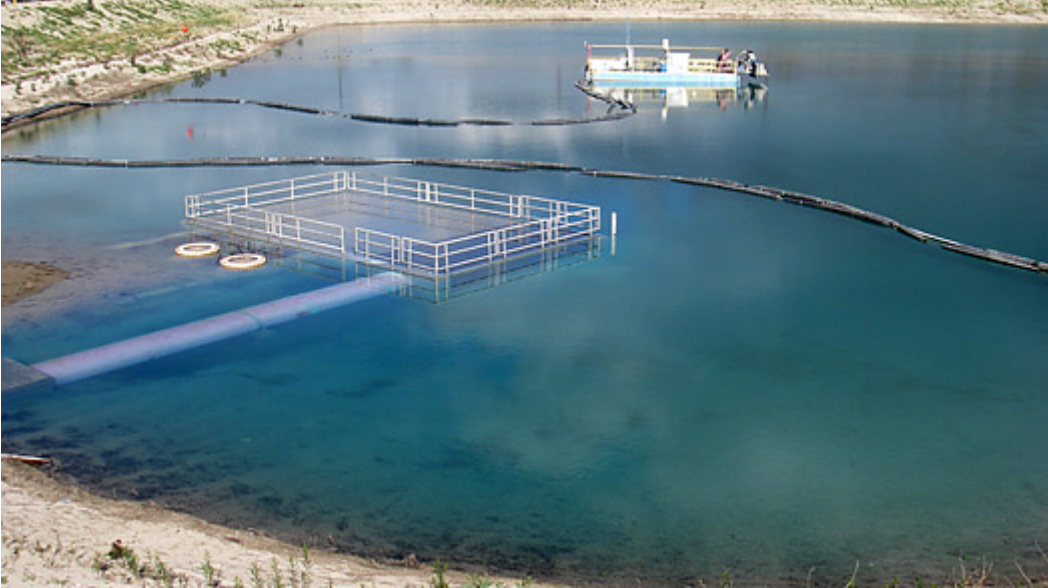


TIME

Sewage That's Clean Enough to Drink

By **BRYAN WALSH**

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Crystal-clear purified water from the Groundwater Replenishment (GWR) System is piped to OCWD's percolation ponds in Anaheim, Calif.

Mark Greening / Orange County Water District

The world has a water crisis — that much is undeniable. But it's also by our own design. Although just a tiny fraction of the world's 326 quintillion gallons of water is usable by humans, we would have more than enough to go around if we took care of it. We don't. From industrial accidents like the benzene spill in northeastern China three years ago, which contaminated the drinking water of millions of people, to the lack of toilets (or proper sanitation) throughout much of the developing world, we're making good water unusable. As a result, our supplies of viable water for agriculture, industry and just for drinking are dwindling, even as population demands continue to grow. We don't just have a water crisis, according to Maude

Barlow, who was last week named the first U.N. senior advisor on water — "we have a clean water crisis." (Listen to Barlow talk about the world's water woes on this week's Greencast.)

That makes what's happening in Orange County, Calif., all the more important. One of the richest residential areas in America, the L.A. suburb is known for swimming pools, golf courses and lush lawns — all of which need water. But like much of southern California, Orange County is dry and getting drier, and the underground aquifer from which the county pumps much of its water is slowly draining. Importing water from wetter northern California is an option, but an expensive one (at least \$530 per acre-foot, or about 326,000 gallons, of water); meanwhile, population growth means that officials have to do something with the increasing amount of wastewater that residents and businesses are producing. ([See the world's most polluted places.](#))

Orange County water officials decided to solve both problems at the same time. The result is the Groundwater Replenishment System (GRS), a glistening, \$480 million facility that sits next to an older sewage treatment plant. The Orange County GRS takes in about 70 million gallons of wastewater a day, puts it through a multistep cleaning process, then discharges the treated water into Orange County's underground aquifers. About half is used to form a barrier against seawater, which has been infiltrating groundwater sources as the county has dried up, while the other half slowly filters into the aquifers that supply drinking water for the county's 2.3 million residents. The GRS is believed to be the world's largest facility dedicated to what's known as indirect potable reuse, if you're in favor

of it, or toilet to tap, if you're not. But there's a better term: water recycling, and it might be the world's answer to the clean water crisis. ([See the pictures of the world's water crisis.](#))

Whether or not we know it, most of us drink water that has had contact with sewage at some point. Municipal water authorities discharge treated wastewater — and in times of heavy rains, untreated water — into rivers like the Colorado or the Mississippi, where the sheer volume of water dilutes any remaining contaminants or pathogens. Orange County, however, is trying something different. Because some of its treated wastewater is injected directly into its reservoirs, residents are effectively drinking water that is mixed with highly treated sewage. It's not surprising then that it took years for the GRS to go forward in the face of public unease. "There was the yuck factor," admits Michael Markus, the general manger of the Orange County water district.

A visit to the plant shows those fears to be unfounded, however. Orange County's wastewater undergoes more stringent treatment than almost any water source on the planet. First, the dark beer-colored sewage is pulled through a series of tubes stuffed with thousands of fibers pierced with holes 1/300th the size of a human hair. Anything larger than 0.2 millionth of a meter — which includes suspended solids and bacteria — is left behind. The cleansed water is then forced at high pressure through hundreds of tubs that are filled with tightly wound plastic membranes. Reverse osmosis, as the process is called, stops non-water molecules — including viruses and pharmaceuticals. (The last part is particularly important; an Associated Press investigation earlier this year found trace amounts of prescription drugs in

the drinking water of over 40 million Americans.) Lastly the filtered water is treated with the disinfectant hydrogen peroxide, and then dosed with ultraviolet light, which neutralizes anything that might remain. What's left is as pure as distilled water — and I can tell from personal experience, tastes perfectly fine. "This is the future of water treatment," says Markus.

Water-strapped Singapore already uses a similar process to augment its reservoirs, and water managers from around the globe have been visiting Orange County to study GRS. Especially in the drier parts of the world — such as the American Southwest, northern China and the Middle East — water recycling could be a way to allow development without turning to even more expensive methods of water reclamation, like desalinization. But what we really need to do is treat water as the limited resource it is, by limiting pollution in the first order, and then reusing it as much as we can. The U.N.'s Barlow, whose mandate is to reduce the number of people worldwide — 1.7 billion — who lack access to clean water, is doubtful about the cost of recycling programs like Orange County's, especially for poorer countries, and she'd like to see more focus on keeping water sources clean in the first place. But she knows recycling is a necessity. "Water is far, far too precious to waste," she says. "It's a universal human right." We just have to treat it like one.